



Performing Diagnostics

This chapter describes the client utility tools that you use to assess the operation and performance of the client adapter and the wireless network.

The following topics are covered in this chapter:

- [Diagnostic Tools for Mac OS 9, page 7-2](#)
- [Diagnostic Tools for Mac OS X, page 7-10](#)
- [Site Survey, page 7-19](#)

Diagnostic Tools for Mac OS 9

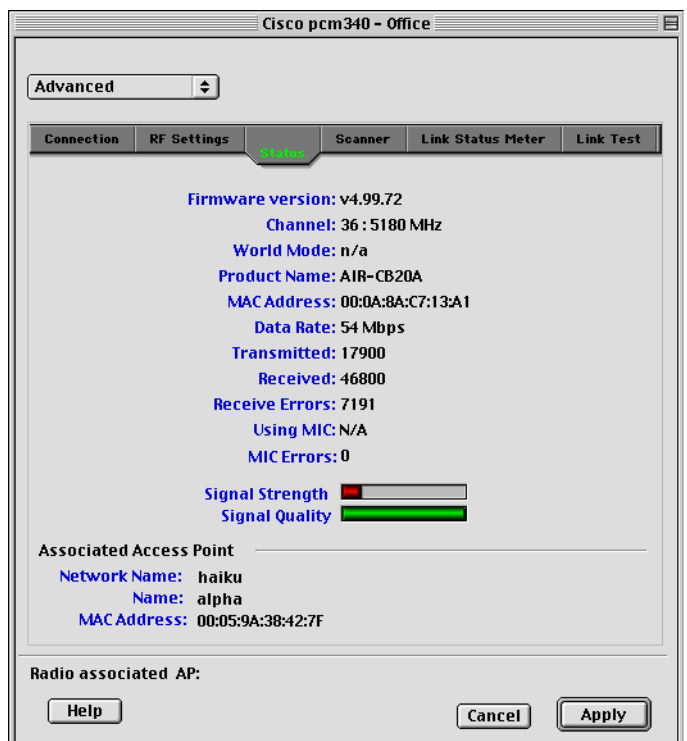
The pcm340PPC client utility provides tools that help you assess the performance of the client adapter and other devices on the wireless network. ACU diagnostic tools perform the following functions:

- Display your client adapter's current status and configured settings
- Run a link test to assess the operation of the RF link between your client adapter and its associated access point
- Run a link test to assess the operation of the wired link between your access point and a wired device
- Obtain information about local access points (configured for broadcast SSID)

Viewing the Current Status of Your Client Adapter

To view your client adapter's status, select the **Status** tab on the advanced properties screen. The Status Screen appears (see [Figure 7-1](#)).

Figure 7-1 Status Screen



[Table 7-3 on page 7-11](#) describes the status information.

Assessing the Wireless and Wired Links

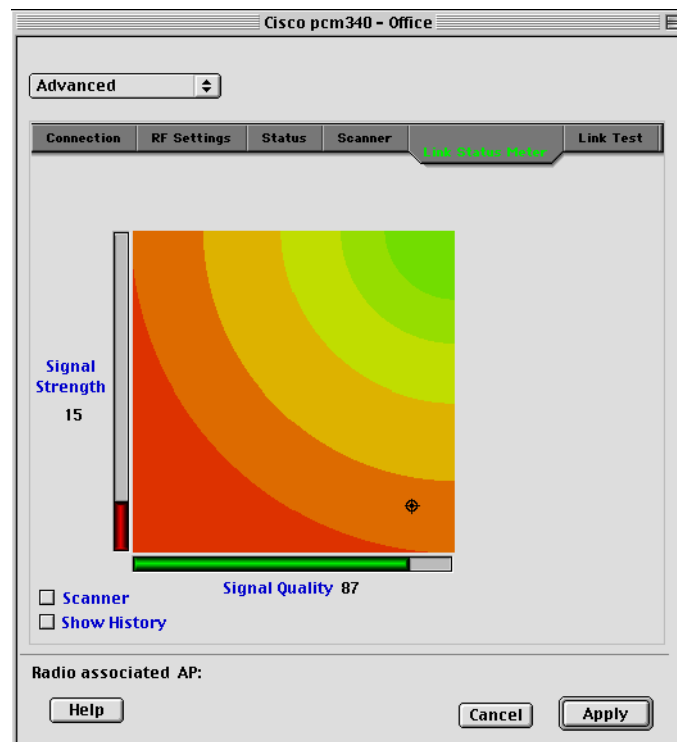
You can determine the performance of the RF link between your client adapter and its associated access point in two different ways:

- You can use the link status meter (LSM) to view a graphical display of the signal strength and quality of the client adapter's radio signal. Go to the [“Viewing the Link Status Meter”](#) section below.
- You can run a link test that allows you to set the number and size of the packets to be transmitted and then to determine the success or failure of those packets. Go to the [“Running a Link Test”](#) section on page 7-4.

Viewing the Link Status Meter

To access the Link Status Meter screen, select **Link Status Meter** on the advanced properties screen. The Link Status Meter screen appears (see [Figure 7-2](#)).

Figure 7-2 Link Status Meter Screen



The Link Status Meter screen provides a graphical display of the following:

- **Signal strength**—The strength of the client adapter's radio signal at the time packets are being received. It is displayed as a percentage along the vertical axis.
- **Signal quality**—The quality of the client adapter's radio signal at the time packets are being received. It is displayed as a percentage along the horizontal axis.

The combined result of the signal strength and signal quality is represented by a moving bull's-eye (see [Figure 7-2](#)). Where the bull's-eye falls on the graphical display determines the quality of the RF link between your client adapter and its associated access point. Differences in the quality of the RF link are indicated by the following colors: green (excellent), yellow (good), orange (fair), and red (poor).

This information can be used to determine the optimum number and placement of access points in your RF network. By using LSM to assess the RF link at various locations, you can avoid areas where performance is weak and eliminate the risk of losing the connection between your client adapter and the access point.

Selecting the Show History check box causes the graphical display to show a recent history of the RF performance between your client adapter and its associated access point. Black dots on the graphical display show the performance of the last 20 measurements. These black dots can be cleared from the display by clicking the Clear History button.

**Note**

The access point that is associated to your client adapter and its IP address are indicated at the bottom of the display.

Running a Link Test

The client utility's link test tool evaluates the operation of the RF link between your client adapter and the associated access point. The test can also be used to check the operation of the wired link connected to the access point. The link test sends out Ping packets to assess the operation of the link (RF link and wired link) between your client adapter and the destination device specified by the IP address. The test is usually performed multiple times at various locations throughout your area and is run at the data rate displayed in the RF Settings section of the advanced screen (see the Data Rate parameter in the [“Setting RF Parameters” section on page 6-14](#)). You can use the results of the link test to determine RF network coverage and ultimately the required number and placement of access points in your network. The test also helps you to avoid areas where performance is weak, thereby eliminating the risk of losing the connection between your client adapter and its associated access point.

**Note**

A link test can also be run from an access point through a Telnet session. Refer to Chapter 4 of the *Cisco Aironet Access Point Software Configuration Guide* for information.

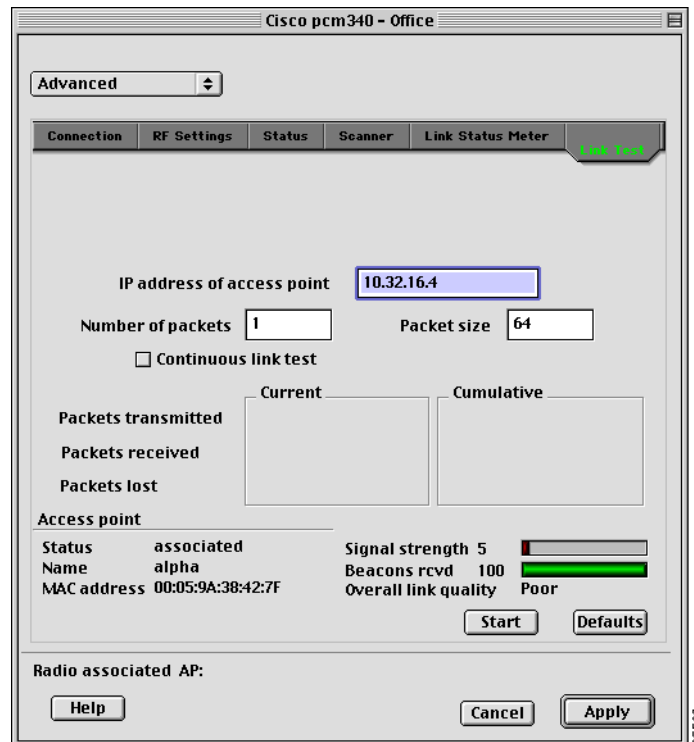
The following prerequisites are required before you can run an RF link test:

- The TCP/IP protocol must be installed on your system.
- Your computer and the access point must have an IP address.
- Your computer must be configured to use the client adapter as its network interface.

Follow the steps below to run a link test.

- Step 1** Select the **Link Test** tab on the advanced properties screen. The Link Test screen appears (see [Figure 7-3](#)).

Figure 7-3 Link Test Screen



- Step 2** In the IP Address of access point field, enter the IP address of the access point or wired device with which you want to test the link.



Note You can specify the IP address of a device on the wired link connected to the access point. This allows the link test to check both the wireless and wired links.

- Step 3** You can set the link test to run until it has attempted to send a specific number of packets or to run until you stop it. Follow one of the steps below to determine how long the link test will run:

- Type the number of packets that the link test should attempt to send in the Number of Packets field. (The Number of Packets parameter is ignored if the Continuous Link Test check box is selected.)

Range: 1 to 1000

Default: 1

- Select the Continuous Link Test check box to allow the link test to run continuously.

Default: Deselected

- Step 4** Type the size of the data packet that is to be sent to the access point in the Packet Size field.

Range: 64 to 1514

Default: 64

Step 5 Click the **Start** button to run the link test. While the test is running, statistics are displayed and updated periodically.

Figure 7-4 shows the Link Test screen while it is running.

Figure 7-4 Link Test Screen (While Running)

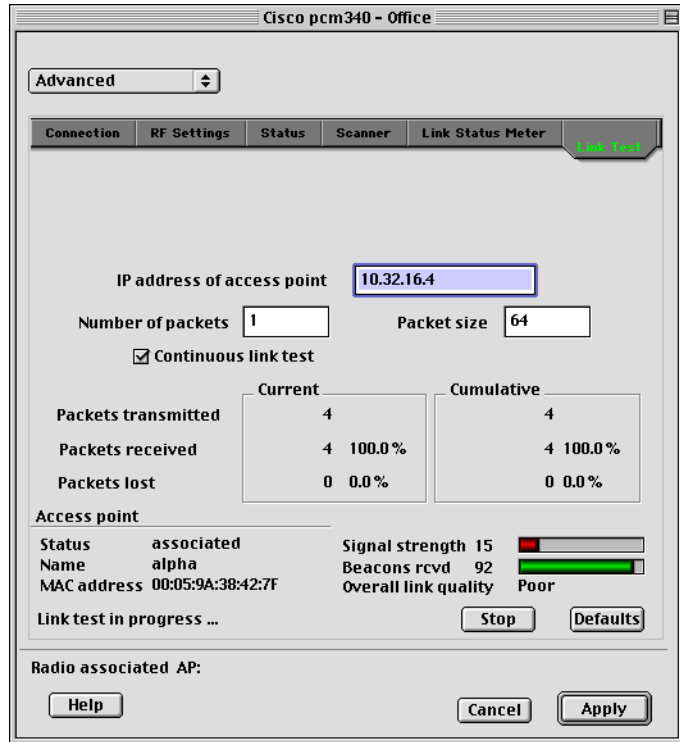


Table 7-1 interprets the statistics that are displayed on the Link Test screen while the link test is running.

Table 7-1 Link Test Statistics

Link Test Statistic	Description
Packets Transmitted	The number of packets of the specified size that were transmitted successfully.
Packets Received	The number of packets of the specified size that were received successfully.
Packets Lost	The number of packets of the specified size that were not received successfully.
Status	The operational mode of your client adapter. Value: Error, Configured, Associated, Not Associated, or Ad Hoc Mode
Name	The name of the access point to which your client adapter is associated. It is shown only if the access point was configured with a name and you are in infrastructure mode.
MAC Address	The MAC address of the access point to which your client adapter is associated. It is shown only if you are in infrastructure mode.

Table 7-1 Link Test Statistics (continued)

Link Test Statistic	Description
Signal Strength	The current signal strength. The higher the value and the more green the bar graph is, the stronger the signal. Range: 0 to 100%
Beacons Received	The percentage of beacon packets received versus those expected to be received. The higher the value and the more green the bar graph is, the better the quality of the signal. Example: The access point sends out 10 beacons per second, so you would expect the client adapter to receive 50 beacon packets in 5 seconds. If it receives only 40 packets, the percentage of beacons received would be 80%. Range: 0 to 100%
Overall Link Quality	The client adapter's ability to communicate with the access point, which is determined by the combined result of the adapter's signal strength and signal quality. Value: Not Associated, Poor, Fair, Good, Excellent

- Step 6** If you did not set the link test to run continuously, the test ends after the specified number of packets is sent, and the Stop button changes back to the Start button. To stop the link test at any time, click **Stop**.

Determining Local Access Points

The client utility detects local access points two ways:

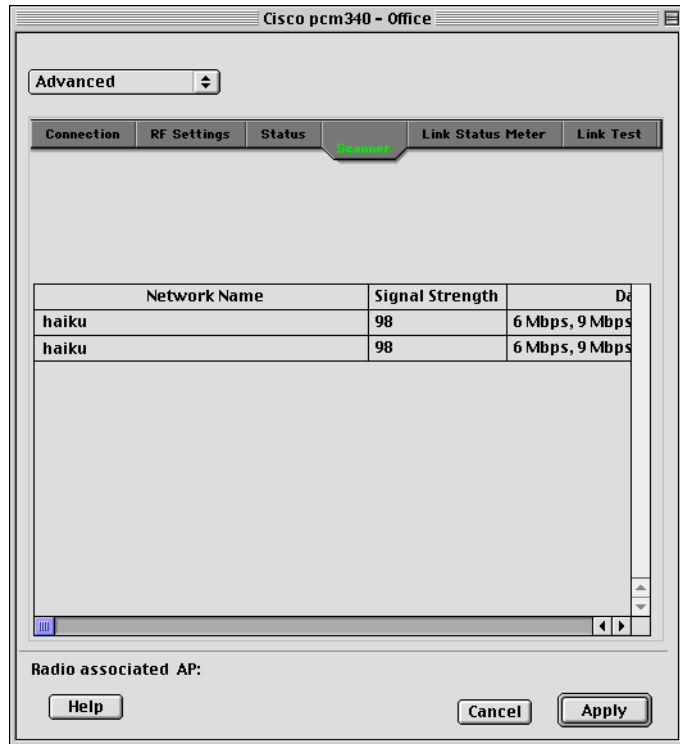
- Scanner tab
- LSM scanner

This section describes how to use these two tools.

Scanner Tab

Click the Scanner tab on the client utility advanced properties screen to display the Scanner Screen (see [Figure 7-5](#)).

Figure 7-5 Scanner Screen



The scanner screen displays information on the detected access points, which can be used to configure your client adapter to associate to an access point.



Note

The client utility scanner displays only local access points that are configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points configured for security.

[Table 7-2](#) lists and describes the parameters on the scanner details screen.

Table 7-2 Scanner Screen Parameters

Parameter	Description
Network Name	The network name or SSID of the access point.
Signal Strength	The signal strength of received signals from the access point. On the Details screen format, the longer the bar graph is, the stronger the signal.
Data Rates	The data rates supported by the access point.
MAC Address	The MAC address of the access point.
Channel	The operating frequency and channel that the access point is using for communications.



Note Use the scroll bar at the bottom of the Scanner Summary Screen to view the fields not in view.

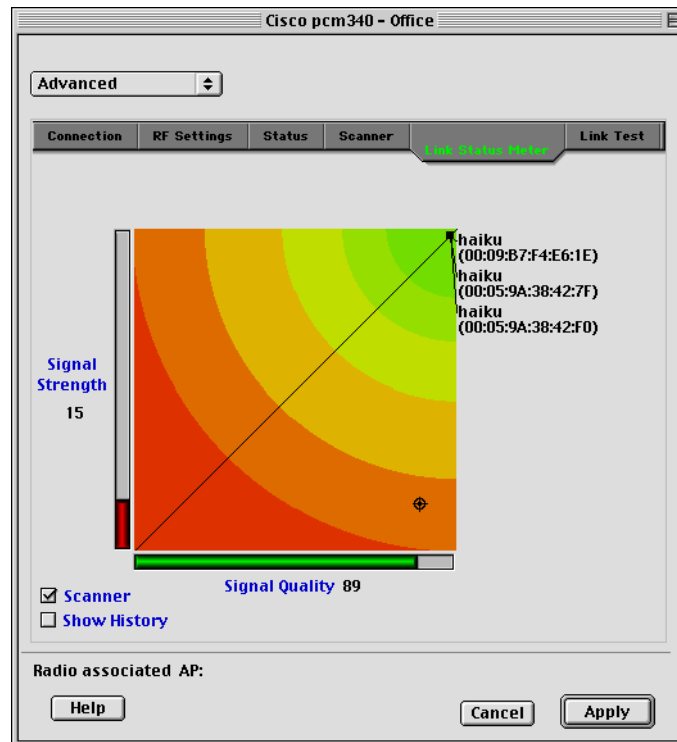
LSM Scanner

Checking the scanner check box on the bottom of the scanner screen provides a graphical scanner display that shows the signal strength of detected access points on a diagonal line. Access points with strong signals are displayed in the green area; those with weak signals are displayed in the red area. Each access point is identified by network name or SSID. If the network name is not available, only the access point MAC address is displayed. The graphical scanner display provides a quick visual indication of the access points and their signal strengths (see [Figure 7-6](#)).



Note The LSM scanner only displays access points configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points that are configured for security.

Figure 7-6 LSM Scanner Screen



Diagnostic Tools for Mac OS X

In addition to allowing you to configure your client adapter for use in various types of networks, the client utility provides tools that allow you to assess the operation of the client adapter and other devices on the wireless network. The client utility's diagnostic tools to perform the following functions:

- Display your client adapter's current status and configured settings
- Run a link test to assess the operation of the RF link between your client adapter and its associated access point
- Run a link test to assess the operation of the wired link between your access point and a wired device
- Obtain information about local access points (configured for broadcast SSID)

Viewing the Current Status of Your Client Adapter

To view your client adapter's status, select the **Status** tab on the advanced properties screen. The status screen is displayed (see [Figure 7-7](#)).

Figure 7-7 Client Utility Advanced Properties Status Screen

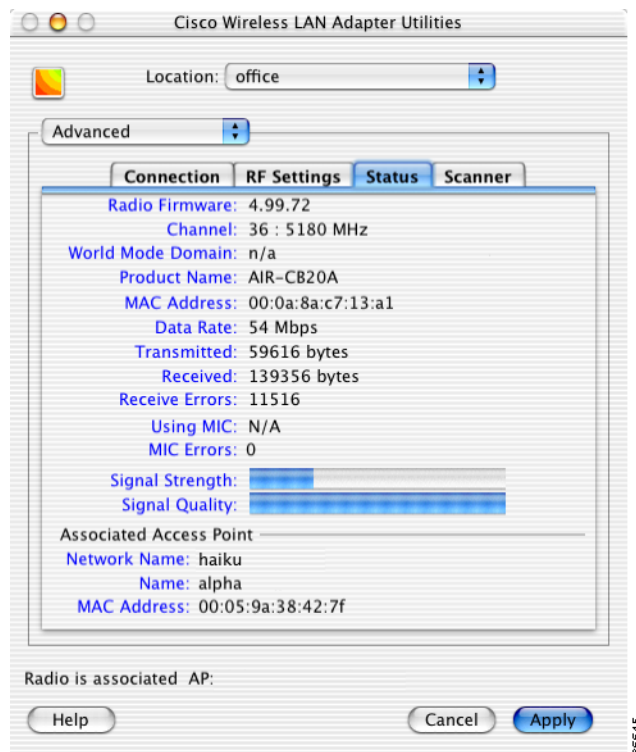


Table 7-3 describes the parameters on the status screen.

Table 7-3 Client Adapter Status Screen Parameters

Parameter	Description
Firmware Version	The version of the radio firmware that is currently running on your client adapter.
Channel	<p>Specifies which frequency your client adapter will use as the channel for communications. These channels conform to the IEEE 802.11 Standard for your regulatory domain.</p> <ul style="list-style-type: none"> In infrastructure mode, this parameter is set automatically and cannot be changed. The client adapter listens to the entire spectrum, selects the best access point to associate to, and uses the same frequency as that access point. In ad hoc mode, the channel of the client adapter must be set to match the channel used by the other clients with which you wish to communicate. <p>Range: Dependent on client adapter radio and regulatory domain Example for 2.4-GHz client adapters: 1 to 11 (2412 to 2462 MHz) in North America Example for 5-GHz client adapters: 36, 40, 44, 48, 52, 56, 60, and 64 (5180, 5200, 5220, 5240, 5260, 5280, 5300, and 5320 MHz) in North America</p> <p>Note Refer to Appendix D, “Channels, Power Levels, and Antenna Gains,” for a list of channel identifiers, channel center frequencies, and regulatory domains for each channel.</p>
World Mode Domain	<p>When world mode is enabled and your client adapter has associated to an access point, this is the channel set adopted by the adapter from the access point.</p> <p>Value: Disabled, Unknown, North America, Europe, Japan, Spain, France, Belgium, Israel, Canada, Australia</p>
Product Name	<p>Identifies the type of client adapter you are using.</p> <p>Value: 340 series, 350 series, or AIR-CB20 series</p>
MAC Address	The MAC address assigned to your client adapter at the factory.
Data Rate	<p>The rate at which your client adapter is currently transmitting data packets.</p> <p>802.11a Values: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps 802.11b Values: 1 Mbps, 2 Mbps, 5.5 Mbps, or 11 Mbps</p>
Transmitted	The number of bytes that were transmitted successfully.
Received	The number of bytes that were received successfully.
Receive Errors	The total number of that were received with errors.

Table 7-3 Client Adapter Status Screen Parameters (continued)

Parameter	Description
Using MIC	<p>Indicates whether your client adapter is using message integrity check (MIC) to protect bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. The following drivers support MIC:</p> <ul style="list-style-type: none"> • Mac OS 9—version 1.0.3 or greater • Mac OS X—version 1.0.1 or greater <p>MIC is used only if it is enabled on the access point.</p> <p>Note If the access point is using MIC, your client adapter’s driver and firmware must support MIC; otherwise, the client cannot associate.</p> <p>Values:</p> <p>Yes—client adapter radio is MIC capable, MIC is enabled on the access point, and MIC is being used.</p> <p>No—client adapter radio is MIC capable, MIC is enabled on the access point, but MIC is not being used.</p> <p>N/A—client adapter radio is not MIC capable.</p> <p>Disabled—client adapter radio is MIC capable, but MIC is disabled.</p>
MIC Errors	Indicates the total number of MIC errors that have occurred.
Signal Strength	The signal strength for received packets. The longer the bar graph is, the stronger the signal.
Signal Quality	The signal quality for received packets. The longer the bar graph is, the better the signal quality.
Network Name	The network name or SSID of your wireless network.
Name	The name of the access point to which your client adapter is associated. It is shown only if the access point was configured with a name and you are in infrastructure mode.
MAC Address	The MAC address of the access point or wireless device to which your client adapter is associated.

Assessing the Wireless and Wired Links

You can determine the operation of the wireless and wired links from your client adapter in two different ways:

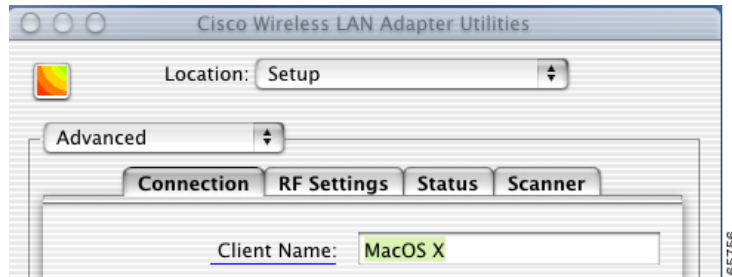
- You can use the link status meter to view a graphical display of the signal strength and quality of the radio signals from the local access points (configured for broadcast SSID). Go to the [“Viewing the Link Status Meter”](#) section below.

- You can run a link test with an access point or a wired device. Go to the [“Running a Link Test” section on page 7-14](#).

Viewing the Link Status Meter

To access the Link Status Meter (LSM) screen, click the LSM icon on the upper left of the Client Utility Advanced Properties Screen (see [Figure 7-8](#)).

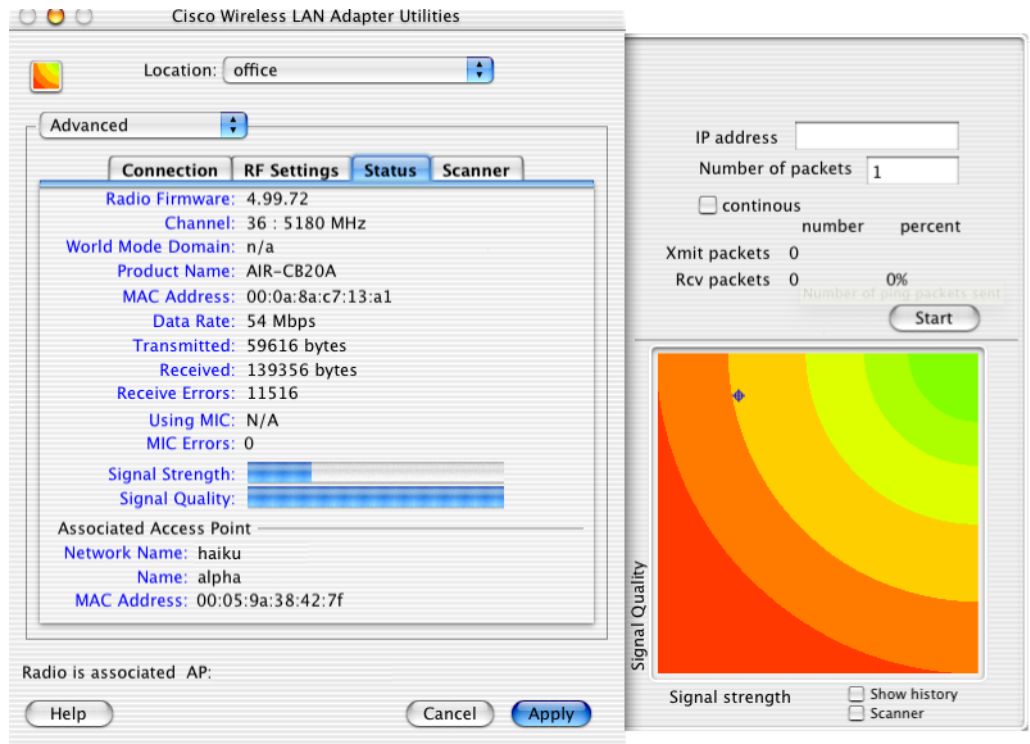
Figure 7-8 LSM Icon on Client Utility Advanced Properties Screen



When you click the LSM icon, the LSM screen typically appears on the right side of the client utility screen. If there is insufficient space on the right side of the client utility screen, the LSM screen appears on the left side.

The LSM screen is shown in [Figure 7-9](#).

Figure 7-9 Status Screen with LSM Screen Displayed



The LSM screen provides a graphical display of the following:

- **Signal quality**—The quality of the access point’s radio signal at the time packets are being received. It is displayed as a percentage along the vertical axis.
- **Signal strength**—The strength of the radio signal received from the associated access point. It is displayed as a percentage along the horizontal axis.

The combined result of the signal strength and signal quality is represented by a moving mark (see [Figure 7-9](#)). Where the mark falls on the graphical display determines the quality of the RF link between your client adapter and its associated access point. Differences in the quality of the RF link are indicated by the following colors: green (excellent), yellow (good), orange (fair), and red (poor).

This information can be used to determine the optimum number and placement of access points in your RF network. By using LSM to assess the RF link at various locations, you can avoid areas where performance is weak and eliminate the risk of losing the connection between your client adapter and the access point.

Selecting the Show History check box causes the graphical display to show a recent history of the RF performance between your client adapter and its associated access point. Black dots on the graphical display show the performance of the last 20 measurements.

Selecting the scanner check box causes the graphical display to show the signal strength of detected access points on a diagonal line. Each access point is identified by Network Name or SSID. If the Network Name is not available, the access point MAC address is displayed. The graphical scanner display provides a quick visual indication of the access point signals.



Note

When the scanner check box is checked, only access points configured for broadcast SSID are displayed. Typically, access points configured for security are not shown.

Running a Link Test

The client utility’s link test tool evaluates the operation of the RF link between your client adapter and the associated access point. The test can also be used to check the operation of the wired link connected to the access point. The link test sends out Ping packets to assess the operation of the link (RF link and wired link) between your client adapter and the destination device specified by the IP address. Initially, the IP address of the associated access point is automatically placed in the IP address field.

The link test does more than test the link between two network devices. It verifies that TCP/IP software and the proper drivers have been loaded and are operating properly.

The following prerequisites are required before you can run a link test:

- The TCP/IP protocol must be installed and operational on your Macintosh computer.
- Your Macintosh computer and the access point must have an IP address.
- Your computer must be configured to use the client adapter as its network interface.

Follow the steps below to run a link test:

-
- Step 1** Click the LSM icon on the upper left of the Client Utility Advanced Properties Screen (see [Figure 7-8](#)). The LSM screen appears (see [Figure 7-9](#)).
- Step 2** In the IP Address field, you can enter a device IP address or use the IP address of the associated access point that is automatically placed in the field.



Note You can specify the IP address of a device on the wired link connected to the access point. This allows the link test to check both the wireless and wired links.

- Step 3** You can set the link test to run until it has completed a specific number of packets or to continuously run until you stop it. Follow one of the steps below to determine how long the link test will run:
- Specify the number of packets (from 1 to 1000) that the link test sends by typing the number in the Number of Packets field. (The Number of Packets parameter is ignored if the Continuous check box is checked.)
 - Check the **Continuous** check box to allow the link test to run continuously.
- Step 4** Click the **Start** button to run the link test. While the test is running, statistics are displayed and updated periodically. For additional information, see [Table 7-4](#).
- Step 5** If you did not set the link test to run continuously, the test ends after the specified number of packets is sent, and the Stop button changes back to the Start button. To stop the link test at any time, click **Stop**.

[Table 7-4](#) interprets the statistics that are displayed on the LSM screen while the link test is running.

Table 7-4 Link Test Statistics

Link Test Statistic	Description
Transmitted Packets	The number of packets that were transmitted successfully.
Received Packets	The number of packets that were received successfully and the percentage of the total transmitted.

Determining Local Access Points

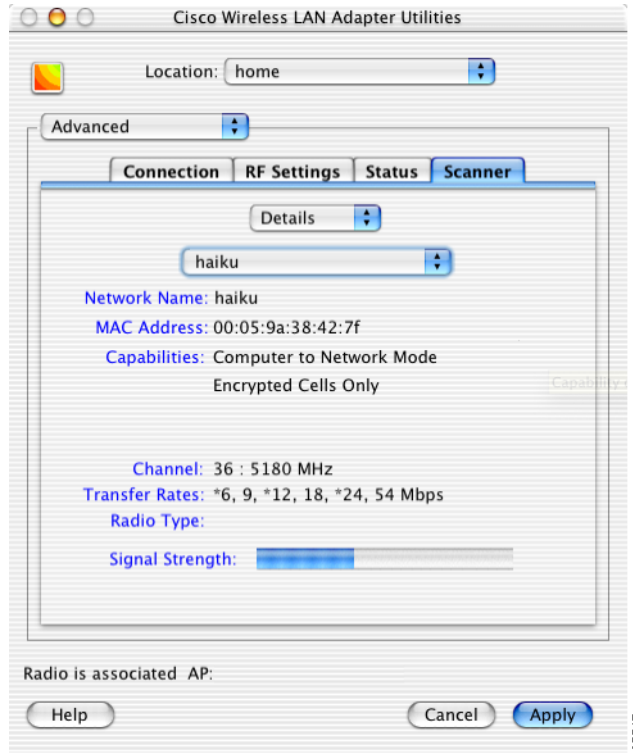
The client utility detect local access points two ways:

- Scanner tab
- LSM scanner

Scanner Tab

When you click the Scanner tab on the client utility advanced properties screen, the Scanner Details Screen is displayed (see [Figure 7-10](#)).

Figure 7-10 Client Utility Scanner Details Screen



The scanner function displays information on the detected access points, which can be used to configure your client adapter to associate to an access point.


Note

The client utility scanner displays only local access points that are configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points configured for security.

Table 7-5 lists and describes the parameters on the scanner details screen.

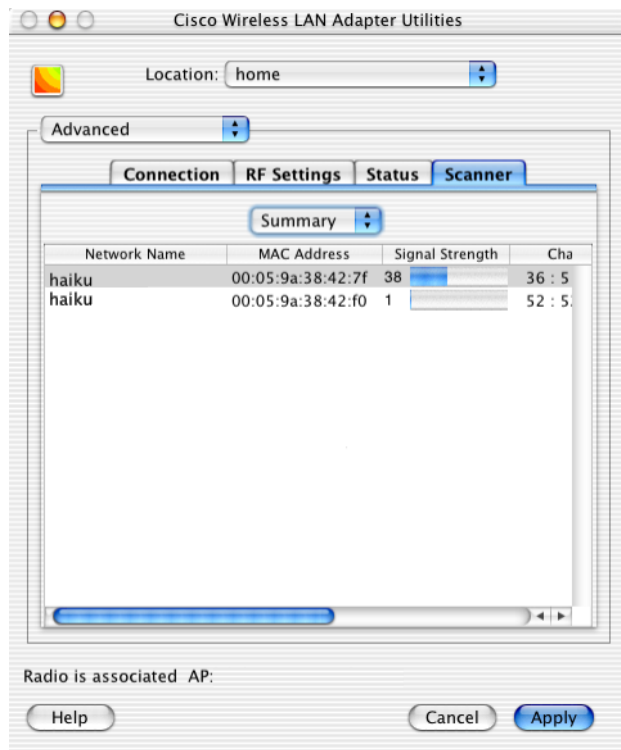
Table 7-5 Scanner Details Screen Parameters

Parameter	Description
Screen Format	Selects the scanner screen format. Two options are supported: Details or Summary. The <i>Details</i> option displays information on a single access point. The <i>Summary</i> option displays a tabular list of all detected access points (see Figure 7-11). Use the up and down arrows on the right of the field to select the screen format options. Range: Details or Summary Default: Details
Detected Access Points	Selects an access point from a drop-down list of detected access points. Use the up and down arrows on the right of the field to display the drop-down list of access points. Only available in the Details screen format.
Network Name	The network name or SSID of the access point.

Table 7-5 Scanner Details Screen Parameters (continued)

Parameter	Description
MAC Address	The MAC address of the access point.
Capabilities	The detected capabilities of the access point, such as network type, encrypted cell, and short header. Only available in the Details screen format.
Channel	The operating frequency and channel that the access point is using for communications.
Transfer Rates	The data rates supported by the access point.
Radio Type	The type of radio used by the access point.
Signal Strength	The signal strength of received signals from the access point. On the Details screen format, the longer the bar graph is, the stronger the signal.

When you select the scanner summary screen format option, the client utility provides scanner information in a list format (see [Figure 7-11](#)).

Figure 7-11 Client Utility Scanner Summary Screen**Note**

You can use the scroll bar at the bottom of the Scanner Summary Screen to view the other fields.

The scanner summary screen provides the following information fields:

- Network Name
- Mac Address
- Signal Strength
- Channel
- Data Rates
- Radio Type

See [Table 7-5](#) for a description of the parameters displayed on the Scanner Summary Screen.

LSM Scanner

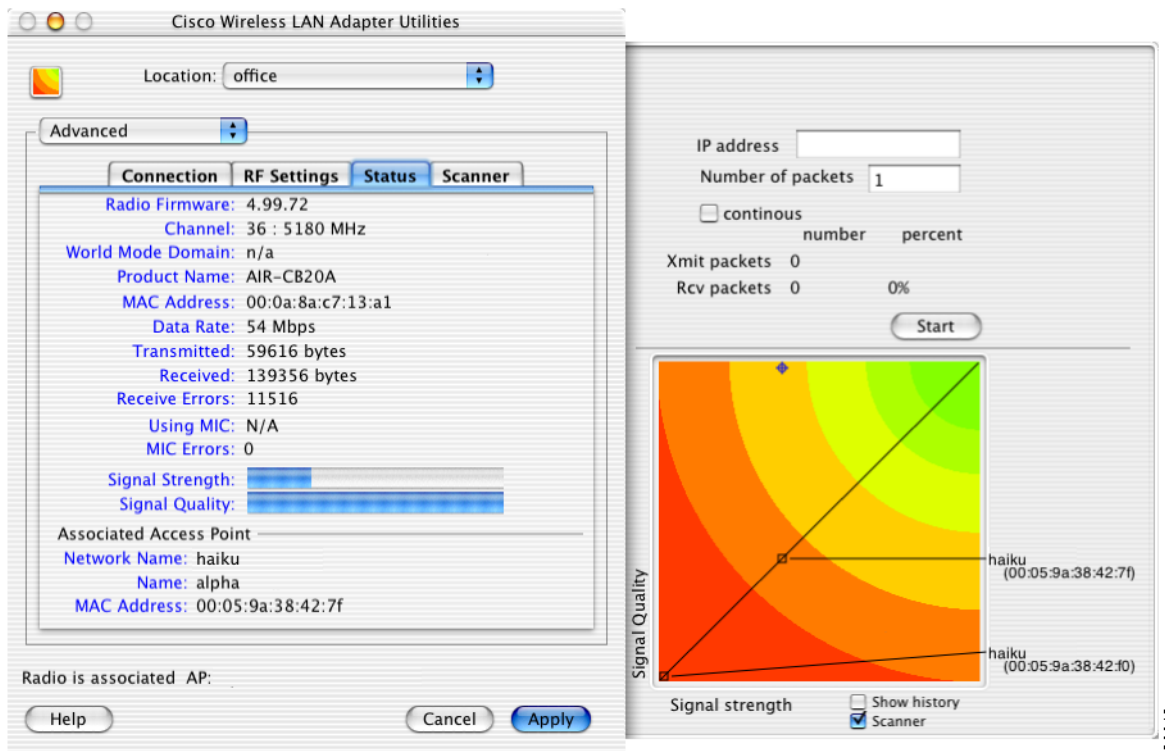
Checking the scanner check box on the bottom of the scanner screen provides a graphical scanner display that shows the signal strength of detected access points on a diagonal line. Access points with strong signals are displayed in the green area; those with weak signals are displayed in the red area. Each access point is identified by network name or SSID. If the network name is not available, only the access point MAC address is displayed. The graphical scanner display provides a quick visual indication of the access points and their signal strengths (see [Figure 7-12](#)).



Note

The LSM scanner only displays access points configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points that are configured for security.

Figure 7-12 Status Screen With LSM Scanner Screen Displayed



Site Survey

Because of differences in component configuration, placement, and physical environment, every network application is a unique installation. You perform a site survey to determine the optimum utilization of networking components and to maximize range, coverage, and network performance.

Consider the following operating and environmental conditions when performing a site survey:

- **Data rates**—Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. A decrease in receiver threshold sensitivity occurs as the radio data increases.
- **Antenna type and placement**—Proper antenna configuration is a critical factor in maximizing radio range. As a general rule, range increases in proportion to antenna height.
- **Physical environment**—Clear or open areas provide better radio range than closed or filled areas. Also, the less cluttered the work environment, the greater the range.
- **Obstructions**—A physical obstruction such as metal shelving or a steel pillar can hinder performance of the client adapter. Avoid locating the workstation in a location where there is a metal barrier between the sending and receiving antennas.
- **Building materials**—Radio penetration is greatly influenced by the building material used in construction. For example, drywall construction allows greater range than concrete blocks. Metal or steel construction is a barrier to radio signals.

Site Survey Guidelines

Keep the following guidelines in mind when preparing to perform a site survey:

- Perform the site survey when the RF link is functioning with all other systems and noise sources operational.
- Set your client adapter's RF Transmit level at different settings to determine the minimum level required to cover the wireless cell.
- Execute the site survey entirely from a mobile station. Move the mobile computer to the locations where you plan to use wireless devices and record signal strength and signal quality information.

Site Survey Diagnostic Tools

The following diagnostic tools can be used to perform a site survey:

- Advanced parameters status screen—provides signal strength, signal quality, and data rate of the access point signal.
- Advanced parameters scanner screen—displays a list of detected access points configured for broadcast SSID and provides the signal strength and the transfer rates supported by the selected access point.
- LSM scanner tool—provides a graphical display that shows the signal strength of all detected access points configured for broadcast SSID.

For more information about using diagnostic tools, refer to the corresponding sections in this chapter.

